THURSDAY, MARCH 26, 1891.

SCIENTIFIC WORTHIES.

XXVII.—LOUIS PASTEUR.

LOUIS PASTEUR was born on December 27, 1822, at Dôle, where his father, an old soldier who had been decorated on the field of battle, worked hard as a tanner. He was an earnest, industrious, and thoughtful man, fond of reading, and very desirous that his son should be well educated and should gain renown in some branch of learning. Father and mother, alike in their enthusiasm and ambition, devoted themselves to their son—they would "make a man of him," they said.

In 1825 they removed to Arbois, and as soon as he was old enough to be admitted as a day-boy, Pasteur began his studies in the Communal College, and there, after the first year or two, he worked hard and gained distinction. Thence he proceeded to Besançon, and thence, after a year's successful study, to the École Normale in Paris, to which, after gaining a high place in the entrance-examination, he was admitted in 1843. His devotion to chemistry had begun while he was a pupil of Prof. Darlay at Besançon, and now he studied it under Dumas at the Sorbonne, and Balard at the École Normale. His love of science became intense: he spent every day in attendance on the lectures, in reading, and in practical work in both chemistry and physics.

Among the teachers in the École by whom he was most encouraged was M. Delafosse, who was especially studying molecular physics, and it was after a conversation with him that Pasteur was guided to the careful study of crystals, and to the inquiry which led him to his first important discovery.

It was known that the tartrate and the paratartrate of soda and ammonia, though exactly isomeric, similar in their atomic composition, specific gravity, and crystalline form, yet differed, not only in many of their chemical relations, but, as Biot had shown, in the fact that a watery solution of the tartrate deflected the plane of polarized light, and that of the paratartrate did not. Pasteur could not believe that bodies apparently identical in atomic composition and construction could thus differ in their relations to light. He had already observed a dissimilarity between the crystals of the tartaric and of the paratartaric acids, in that the latter were, and the former were not, symmetrical; and he found the same difference between the crystals of their salts. Now, by a laborious study and repeated measurements of the crystals of these and other similar compounds, he showed that in the paratartaric (now called racemic) acid there are two distinct forms of tartaric acid, of which the one dextro-tartaric) is identical with the ordinary tartaric, and like it, in solution, deflects light to the right; the other (lævo-tartaric) deflects it to the left. The two in combination, as they occur in the ordinary paratartaric acid, neutralize one another in their influences on polarized light, and do not deflect it in either direction. Similarly, he next found that the crystals of the two acids and of their respective salts are different in their forms; those of the dextro-tartaric and its salts are similar to those of the ordinary tartaric and its salts in their dissymmetry; those of the lævo-tartaric are also dissymmetrical, but in the opposite direction; those of the two combined in the paratartaric and its salts are symmetrical.

Thus was explained the seeming anomaly of so distinct a difference between bodies exactly isomeric. A great problem was solved; and it was among its results that, gradually, the way was made clearer by which the synthesis of organic alkaloids and of sugars has been achieved.

These researches had occupied six years, and Pasteur had gained by them an early high renown, and he hoped that, by continuing to work on the same lines, he might obtain results yet more important, especially in the contrast of the symmetrical forms of crystals derived from the chemistry of dead substances, and the dissymmetrical of those derived from the chemistry of living bodies. He had invented instruments and methods for experiments. But it chanced that at this period of his work he was, in 1854, appointed Dean of the Faculty of Sciences at Lille, and, though he gave up crystallography with great regret, he determined to investigate and teach a subject of more direct utility. The chief industry of the town was in the manufacture of alcohol from beetroot and corn, and he decided to teach the scientific methods of improving it, and to promote the scientific brewing of beer that might compete with those of Germany and Austria.

Hence, fermentation became his chief study, and in this was the beginning of the researches which led to the most important of his discoveries. But, although it may have seemed like entering on a new subject, the change was an illustration of the regular sequence that may be observed in the order of all Pasteur's work, for, among the facts which had most influence on the course of his investigations, was one which he had observed in his study of the tartaric salts. He had traced the fermentation of the ordinary right tartrate of ammonia in a solution containing albuminous matter, and had observed the coincident appearance of a distinct micro-organism. Then, he had shown the breaking up of the composition of the paratartaric acid by a similar process of fermentation, by putting a minute portion of green mould into water containing phosphate of potassium and ammonia, but no albuminous matter. Here also there was an abundant formation of organisms, and, with this, the gradual disappearance of the dextro-tartaric acid, of which, as other experiments showed, the carbon was taken for the sustenance and growth of the organism of the mould. In both cases the fermentation had seemed due to the action of a living organism.

Pasteur's belief that these and all processes of fermentation were primarily and essentially due to the presence and action of minute living organisms in the variously fermentescible fluids led him to study them with the combined chemical and microscopical research which no one before him had ever used with the same constancy or the same skill. It was, indeed, a combination of methods of research which had hardly ever before been used. There were excellent chemists and there were excellent microscopists; but they usually worked apart, and hardly helped one another. Pasteur—well instructed in exact methods of research, and both chemist and microscopist—attained results far beyond what any before him had reached. It was no easy thing for him to justify the study of fermentation on the lines suggested by what was called the vitalistic or germ-theory, when the hypothesis of "spontaneous generation" was held by many, and when the whole process of fermentation seemed so well explained by the chemical theory of Berzelius, or by that of communicated molecular motion held by Liebig and others who agreed with him in thinking that the organisms in fermenting liquids might be considered as accidental, except in so far as they might supply organic matter to the liquid. But Pasteur did more than justify the germ theory; for he proved its truth by a multitude of facts previously unobserved, and from which he constructed general principles of which both the scientific value and the practical utility are now beyond estimate.

It is not possible to describe in detail or in chronological order the course and methods of Pasteur's researches on the various fermentations and on processes closely allied to them. Only their chief results can here be told; only the things which he discovered, or which, since he studied them, have been deemed not merely probable, but sure. Thus, he proved the constant presence of living micro-organisms, not only in yeast, in which Cagniard-Latour, and Schwann, especially, had studied them, but in all the fermenting substances that he examined; he proved the certain and complete prevention of fermentation, putrefaction, and other similar processes in many substances, however naturally subject to them, by the exclusion of all micro-organisms and their germs, or by their destruction if present; and he proved the constant presence of various micro-organisms and their germs in the air and water, in the earth, in dust and dirt of every kind—their abundance "everywhere." By the proof of these things the evidence became complete, that fermentations and similar processes are primarily and essentially due to the action of organisms living in the fermenting substance. But, more than this, it was ascertained that each method of fermentation—vinous, lactic, acetic, putrefactive, or whatever it may be—is due to a distinct specific micro-organism appropriate to that method, and by its own vital processes initiating the changes which lead to the formation of the "specific products" of the fermentation, the alcohol, the vinegar, the virus, or whatever else. For each specific micro-organism has to live on the constituents of an appropriate fermentescible fluid which it decomposes, assimilating to itself such elementary substances as it needs for its own maintenance and increase, and leaving the rest to combine in the forming of the "specific products." Further, and most importantly, it was made certain by Pasteur's investigations that, by various appropriate methods of "cultivation" which he invented, the individuals of each species of ferment may be separated from others with which they are mingled, and that, thus separated, the individuals of each species may, by means of a "pure cultivation" be multiplied indefinitely, as, especially, in the production of "pure yeast." And in certain instances it was shown that the active power of micro-organisms may, by cultivation, be so "attenuated" that they will produce only comparatively slight changes in substances which, in their natural state, they potently affect.

The most direct applications of the results of Pasteur's studies of fermentation were, naturally, made in the manufacture of wine and vinegar, and, at a later time, of beer. The "diseases," as they were fairly called, of these fermented liquors, the "thickness," "ropiness," "sourness," and others, could be traced to the disturbing influences of various other micro-organisms mingled with those of pure yeast, the true alcoholic ferment, and each producing an injurious method of fermentation. This being made sure, the prevention of the diseases became possible, by the exclusion or the destruction of every organism other than the true one; and of this one the proper cultivation could insure the sufficient production. The methods of thus preventing or arresting the diseases have become too various to be described here. Among them is that of heating wines and beers sufficiently to destroy all the germs remaining in them; and the uses of this, which has been specially called Pasteurization, and of many others, have made brewing and wine-making nearly secure against the great losses to which, before Pasteur's time, they were always liable from the disturbances of their fermentations.

The utility of the proof that fermentations, including the putrefactive, are absolutely dependent on the action of living micro-organisms was speedily shown in the prevention or remedy of diseases far more important than those of wine and beer. The discovery of the causes and processes of what were justly called the "diseases" of fermented liquids enlarged the whole range of a great section of pathology, showing, as it soon did, so intimate relations between contagious diseases and disordered fermentations that it became safe to apply the facts found in the more simple to the study and treatment of the most complex. The study of the diseases of fermented liquids led straightway to the practice of antiseptic surgery. Its first practical application in medicine was in 1862, when Pasteur, who had proved the existence of a living organism in fermenting ammoniacal urine from a diseased bladder, recommended the washing of such bladders with a solution of boracic acid, now a well-known "germicide." This was done successfully by M. Guyon, and the practice is still commonly followed.

For the treatment of wounds and of parts exposed by wounds, the whole subject of the complete exclusion of micro-organisms, and of their destruction if present, was, in and after 1865, studied with especial care by Sir Joseph Lister, and the results obtained by him and others following his example were so convincing that the antiseptic practice, which many justly call Listerism, is followed everywhere by every surgeon of repute. The methods of excluding micro-organisms from all wounds, the antiseptic substances employed, the modes of applying them are more than need be told, and they increase every year; but they have all the same design—the complete exclusion or destruction of all living germs and micro-organisms capable of exciting putrefaction or any other fermentation in parts exposed by wounds; their exclusion from air, water, sponges, surgical instruments, dressings, and everything that can come in contact with such parts. And the system is not nearly limited to the treatment of wounds. In various methods and degrees it is applied in the construction of hospitals and infirmaries, in the prevention of the spread of infection and of every form of blood-poisoning. It is impossible to estimate the number of the thousands of lives that are thus annually saved by practices which are the direct consequences of Pasteur's observations on the action of living ferments, and of Lister's application of them. In the practice of surgery alone, they are by far the most important of the means by which the risks of death or serious illness after wounds are reduced to less than half of what they were thirty years ago; and of the means by which a large number of operations, such as, at that time, would have been so dangerous that no prudent surgeon would have performed them, are now safely done.

In antiseptic practice, and in the manufactures connected with fermentation, the design is to exclude or destroy all micro-organisms. Many kinds might be harmless, but at present there are no ready and sure means of excluding only those from which mischief might arise, and therefore, in the schemes for complete exclusion, no account is taken of the great general principle established by Pasteur, that each method of fermentation is due to the action of one special living organism. This in relation to contagious diseases, would now have become one of the chief subjects of his study. But again, he was obliged to change the subject of his work; for in 1865 he was urged by Dumas, and was forced to consent, to undertake the investigation of a disease of silkworms in the south of France. Since 1849 this disease, called *pébrine*, had been ruinously prevalent. In 1865 the loss due to it was estimated at four millions sterling, and it had spread to many other countries from which silkworms' eggs had been brought to France. M. Quatrefages had reported to the Academy that, among the results of many previous injuries, especially by Italian naturalists, minute "corpuscles" had been found in the bodies of diseased silkworms and in the moths and their eggs. Pasteur, of course, suspected that these were disease-giving organisms, and directed his chief studies to them, though not without making a careful investigation of the whole disease—a task in which he proved himself to be, not only a chemist and microscopist, but an excellent clinical observer.

He soon found that, among several diseases of silkworms, the two most important were *pébrine*, which was specially called *the* silkworm disease, and was the most destructive, and another, often very prevalent, called *flacherie*. He found "corpuscles" in both, and he confirmed and widely extended the observations of those who had already studied them. But the most important facts, both for the prevention of the *pébrine* and for general pathology, were those by which he showed that it was not only contagious but hereditary. The proof of its being contagious was chiefly seen, as by others, in the inoculations of silkworms through accidental wounds, and in the consequences of their feeding on mulberry-leaves on which the disease-germs had been deposited. Many of the worms thus, or in any other way, infected soon died; in many the material for their silk was spoiled; in others, the disease continued, after, their spinning, in their chrysalides and in the moths developed from them. These moths laid diseased eggs and of these were born diseased worms, which died young, or, at the most, were spoiled for the production of silk, and so long as they lived were sources of contagion. Thus the disease passed on by inheritance from year to year. The germs in eggs laid by diseased moths survived; but those left on leaves, or in the dust, or in the bodies of dead moths, soon perished; only in the diseased and living eggs was the contagion maintained.

These things were proved by repeated experiments, and by observations by Pasteur in his own breeding-chamber, year after year; and they made him believe that the disease might be put an end to by the destruction of all diseased eggs. To this end he invented the plan which has been universally adopted, and has restored a source of wealth to the silk-districts. Each female moth, when ready to lay eggs, is placed on a separate piece of linen on which it may lay them all. After it has laid them and has died it is dried and then pounded in water, and the water is examined microscopically. If "corpuscles" are found in it, the whole of the eggs of this moth, and the linen on which they were laid, are burnt; if no corpuscles are found, the eggs are kept, to be, in due time, hatched, and they yield healthy silkworms.

Pasteur continued these studies for four years, going every year for several months to a little house near Alais, in which he watched every step in the life of the silkworms bred and fed by himself and others. His other investigations had thus been in no small degree interrupted; but worse interruption came in October 1868, when, as it seemed from overwork, he had a paralytic stroke. For a time his life was in great peril; but, happily, he recovered, and without mental impairment, though with permanent partial loss of power on his left side. For nearly two years he could do very little beyond directing experiments for repeating and testing his researches at Alais in 1869, and in Austria in 1870. Then came the French-German war, the misery of which, added to that of his paralysis, made him utterly unfit for work. At the end of the war he returned to work, and, after careful researches on the diseases of beer, similar to those by which he had studied the diseases of wines, he gave himself especially to the study of the "virulent diseases" of animals—the diseases which might reasonably be suspected to be due to different kinds of "virus" derived from different species of micro-organisms. The suspicion was already justified by what he had observed in the diseases of wine and beer, and by some more direct facts: for, in 1850, Rayer and Davaine had found organisms in the blood of animals with anthrax; and in 1865, Davaine, stirred by Pasteur's recent demonstrations of organisms much like these as agents in the butyric fermentation, had gathered evidence of the absolute dependence of anthrax on the presence of these organisms in the blood. But his observations were disputed, and his conclusions not accepted, till Pasteur proved that they were correct, and then extended his researches over a far wider range of subjects. The objects of research in this wider range included, indeed only a small proportion of the diseases connected with micro-organisms; but in a few years it was made certain that some, and probable that all, of the diseases usually classed as virulent, contagious, or specific, are due to distinct living micro-organisms, and to the products of the changes which are initiated by them in the blood or other fluids or substances in which they live. Thus, that which had often been an ingenious hypothesis of a *contagium animatum* became an accepted general law; diseases that had been called virulent were now more often called parasitic; and it may justly be said that Pasteur's researches were the efficient beginning of the vast science of bacteriology—vast alike in natural history and in pathology and in its intimate relations with organic chemistry.

Besides ascertaining the micro-organisms appropriate to several diseases, Pasteur, still working on the lines which he had followed in his studies of fermentation and of the diseases of beer and wine, found various means of "cultivating" the germs, separating them, multiplying them, and then testing their different influences on different animals, or on the same animals in different conditions, or after various changes induced in themselves. Among these changes, the most important and most fruitful in its further study were the various means of "attenuation" by which the virulence of disease-producing micro-organisms can gradually be so diminished that at last they can, without harm, be inoculated or injected into an animal which they would have rapidly killed if similarly inserted in their natural state. And some of these injections were shown to be better than harmless, for, by conveying the disease in a very mild form, they rendered the animal, for some considerable time, insusceptible of that same disease in a more severe form; they conferred an immunity similar to that given by mild attacks of the contagious fevers which, as it is commonly and often truly said, "can be had only once." Or, as Pasteur held, the inoculation with the attenuated virus was similar to vaccination, which gives protection from small-pox by producing similar disease in a milder form. Hence began the practice of "protective inoculation" for many diseases besides small-pox.

In studying the methods of attenuation, Pasteur found many facts which are not only valuable in bacteriology, but are likely to help to the knowledge of important principles in general pathology. To cite only a few examples—he found marked differences among the micro-organisms of different ferments in their degrees of dependence on air. The great majority need oxygen for the maintenance of life; but unlike these, which he named aërobic, were some anaërobic, the first examples ever known of organisms capable of living without oxygen. He showed that the bacilli of anthrax, being aërobic, soon perish and disappear in the blood of the animals that have died of the diseases due to them, and that in the same blood the anaërobic septic bacilli needing no oxygen now appear and multiply. In anthrax, also, he showed that the attenuation may best be attained by keeping the cultivated bacilli at a high temperature (about 42° C.) for a certain number of days, regulated according to daily tests of the reduction of their virulence. In the end they become incapable of killing even mice, and are protective for sheep and cattle, and other animals, which in their natural intensity they would rarely fail to kill. In chicken-cholera, the disease for which the first experiments in protective inoculation were made, he showed that the due attenuation can be obtained by a series of successive cultivations of the micro-organisms in pure air, provided that intervals of several days or weeks are allowed between each two of the cultivations in the series. In experiments on the transmission of the virus of a disease of one species through a succession of animals of another species, he showed that the virulence of the bacilli of swine-erysipelas was increased by transmission through pigeons, but diminished by transmission through rabbits. And, as to the varying susceptibility of the same animal under different conditions, a fact so commonly observed in man, he showed that chickens, which are ordinarily insusceptible of anthrax, could be made susceptible by lowering their temperature. They became again susceptible when their natural temperature was restored; and when apparently dying of anthrax in the cold, they recovered if warmed.

It was a step far beyond what had been obtained by protective inoculations when Pasteur invented and proved the utility of his treatment of rabies. Here he proved that when a virus has been inoculated or in any way so inserted that it may justly be deemed sure to destroy life, this result may, at least in the case of rabies, be prevented by a daily or otherwise gradual series of inoculations, beginning with the same virus very attenuated, and diminishing the degree of attenuation till it is used in such intensity as, without the previous graduated inoculations, would certainly have been fatal. The results of the treatment of rabies on this principle are well known; its success is certain, and is enough to justify the hope that by similar treatment, whether with virus simply attenuated, or with some "lymph" derived from a cultivated virus, or from the chemical products of its action on the liquids in which it has grown, other specific diseases may be similarly controlled. This is especially probable for those in which, as in rabies, there is a clear interval between the entrance of the virus and the first outbreak of the disease; and it is becoming very probable that tuberculosis will be one of these. But it would be useless to imagine the probabilities of what will now follow from the researches that have already followed the discoveries of Pasteur.

It hardly need be said that this summary of Pasteur's life and works, and of the chief results to which they have led, can give no fair estimate of the number and the variety of his experiments and observations. Only a complete personal study of his published works, and especially of those in the *Comptes rendus de l'Académie des Sciences*, can give this. Yet even a mere summary may indicate the most notable points that may be studied in his scientific character: of his charming personal character there is no need to speak here. Clearly, he had a native fitness and love for the study of natural science, and these were well educated, and have been manifest in his whole life. But with this loving devotion to science, he has shown not only a very rare power both of thinking and of observing, but that spirit of enterprise which stirs to constant activity in the search after truth, especially by way of experiment. With the power of accurately thinking what is likely to be true, he shows a happily adjusted ingenuity in the invention of experiments for tests of thoughts, and the habit of doubting the value of any scientific thought, even of his own, which does not bear experimental tests. Especially, the thoughts of what may be true in biology seem to have been always submitted, if possible, to tests as strict as those that may be used in chemistry and physics; and they appear to have been repeated and varied with admirable patience and perseverance whenever any doubt of previous conclusions was felt by himself or reasonably expressed by others. He has practised what he urged on his younger colleagues at the opening of the Pasteur Institute: "N'avancez rien qui ne puisse être prouvé d'une façon simple et décisive." Besides, with all his mental power and caution, we can see, in the course and results of Pasteur's work, the evidence of rare courage and strong will, and of singular skill in the use of the best means of scientific investigation. He has been chemist, microscopist, and naturalist, and has applied all the knowledge thus gained to the practical study of pathology. It is not strange that he has attained the results of which the best, and only the best, have here been told.

The honours that have been bestowed on Pasteur need not be mentioned. His chief reward may be in the happiness of seeing some of the results of his life-long work; and, indeed, very few scientific men have lived to see their work bear such good and abundant fruit. No field of biological study has in the last twenty years been so effectually studied as that which he opened, and in which he showed the right methods of research. Now, wherever biology is largely taught, the bacteriological laboratory has its place with the chemical and the physiological; and, for a memorial of the gratitude not only of France, but of many other nations, there is in Paris the Pasteur Institute, which was constructed at a cost of more than £100,000, and was opened in 1889. Here, he may not only see the daily use of his treatment for the prevention of rabies, but may observe and still take his part in the extension of the vast range of knowledge in which there has been constant increase ever since the first sure steps were made by his discoveries.

JAMES PAGET.

THE PAST HISTORY OF THE GREAT SALT LAKE (UTAH).

Lake Bonneville. By Grove Karl Gilbert. "Monographs of the United States Geological Survey," Vol. I. (Washington, 1890.)

WEST of the Rocky Mountains, inclosed by regions which drain to the Pacific, is the extensive area which bears the name of the Great Basin, for from it there is no outflow. This basin in form is rudely triangular, the most acute angle pointing southward, and its greatest length is about 880 miles. At the broader end the general elevation of the wide valleys or plains, which intervene between a series of parallel ridges, is about 5000 feet above the sea; at the narrower end the ground descends gradually till it is about on, or even below, the sea-level. Streams empty themselves into inland lakes in different parts of the Basin, the most important of these being familiar to everyone as the Great Salt Lake of Utah. This, however, is only the shrunken representative of a grander predecessor, a mere brine-pan compared with its fresh and far-spread waters. To a height of about 1000 feet above the present surface, the evidence of lacustrine wave-work and lacustrine sedimentation can still be traced, and to the lake thus indicated the American geologists have given the name of Lake Bonneville. This, in general outline, was rudely pear-shaped, but its shore-line was very irregular, a succession of jutting headlands and deep bays; its surface also was broken with islands. Its area measured about 19,750 miles, not much less than that of Lake Huron. This is now a region of arid deserts, spotted here and there with a salt marsh or a lagoon, and diversified by the Great Salt Lake and two others of smaller size. The greatest depth was originally 1050 feet, for the Great Salt Lake does not exceed 50 feet in any part. Then the waters of Lake Bonneville found an outlet at the northern end, not far away from the mouth of the Bear River, which is now the principal affluent of the Salt Lake. The rainfall then in the northern part of the Great Basin must have been much heavier than it is now; as it diminished, Lake Bonneville contracted in size and increased in saltness. The annual rainfall in this district is now only about 7 inches, while over the region between the Appalachians and the Mississippi it is 43 inches. In the latter the average moisture in the air is about 69 per cent. of saturation, in the former it is only 45; while the evaporation from the surface of Lake Michigan is only 22 inches per annum, for the Great Salt Lake it amounts to 80 inches. The level of the water in the latter is subject to oscillations, dependent partly on variations in the rainfall, partly on the results of extended cultivation, and appears likely in the future to fall somewhat below its present height.

In the disappearance of the ancient lake, epochs—sometimes perhaps rather long—of stability appear to have alternated with eras of change; at any rate, shore-cliffs, terraces, spits, and bars of detritus are very distinctly grouped at intervals above the present water-level. Owing to the scanty rainfall, and the absence, until late years, of any attempt at cultivation, these natural features are preserved with unusual distinctness. In the admirable plates by which the memoir is illustrated, we can see the enclosing hills, bare and arid, but furrowed into a thousand gulleys by the transient storms of myriad years; the wave-worn cliffs which overlooked the margin of the vanished lake; the long shelving slopes which formed its bed; the water-worn *débris*, here accumulated in a long spit, and indicating the general set of the waves; there piled up in a bar, which now runs, like a railway embankment, from headland to headland across the opening of a bay. The plates in themselves are an object-lesson in physical geography.

The origin of the basin of Lake Bonneville, as of all other large lake basins, is undoubtedly, as Mr. Gilbert points out, deformation of the earth's crust, or *diastrophism*, as he proposes to call it. But there is evidence to show—and this is a point of much interest—that during the process of desiccation, this crust has not remained absolutely at rest; these "bench marks" afforded by the lake margins have undergone movements which are not uniform in amount. They are found, on examination, to exhibit variations amounting in some cases to about 350 feet in altitude. Faults, also, may be traced for considerable distances which are later in date than the desiccation of Lake Bonneville. These in places are made very distinct by scarps, crossing lines of terraces or alluvial fans, and facing outwards towards the lower ground. These faults, however, do not indicate any great displacement. The maximum throw does not exceed about 60 feet, and it is often less. Certain localities